

# Monitoring Water Quality and Non-Point Source Pollution in Coastal Ecosystems



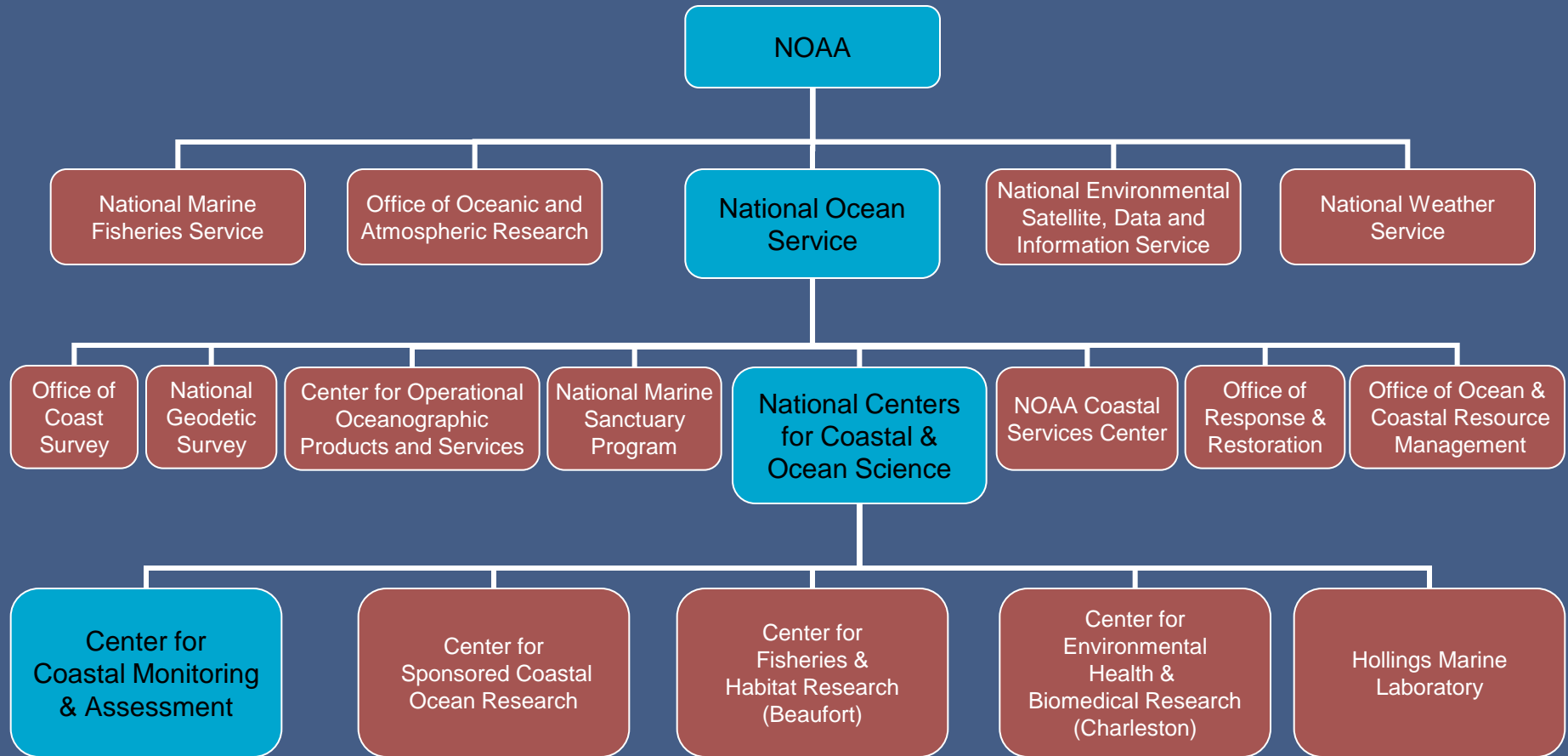
*Dr. David Whitall, PhD*

**Center for Coastal Monitoring and Assessment  
National Centers for Coastal Ocean Science  
National Ocean Service**



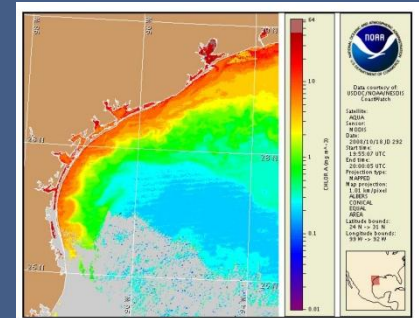
<http://ccmaserver.nos.noaa.gov/>

# Center for Coastal Monitoring and Assessment



# CCMA Goals and Products

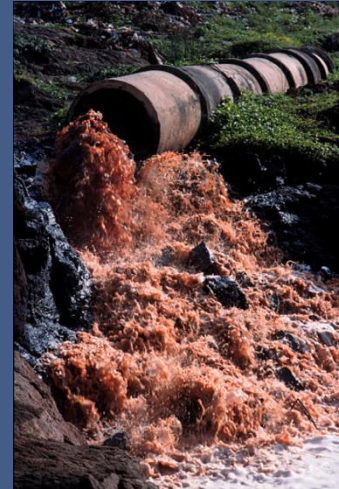
- National Status and Trends Program
  - Monitoring water quality in Nation's coastal waters and Great Lakes, including *non-point source pollution*
- Remote Sensing
  - Coastal oceanographic products
  - Harmful Algal Bloom detection and forecasting
- Biogeography
  - distribution and ecology of living marine resources





# What is Non-Point Source Pollution?

- Point source – think “pipes” —————→
- Non-point source is everything else. Primarily runoff, but also atmospheric deposition, groundwater...anything where it is unclear exactly where the pollution is coming from



# Non-point source pollution comes in many forms:

## Nutrients

nitrogen (nitrate, ammonium, organic N)

phosphorus (ortho phosphate, organic P)

## Metals

Copper, arsenic

Polycyclic Aromatic Hydrocarbons (PAHs)

Pesticides (e.g. acetochlor, alachlor, atrazine)



# Non-point source pollution comes from many sources:

Nutrients : agriculture, golf courses, lawns, septic systems,  
atmospheric deposition

Copper: agriculture, anti-fouling paint

Arsenic: poultry farming

PAHs: occur in fossil fuels and as combustion byproducts  
(cars and boats)

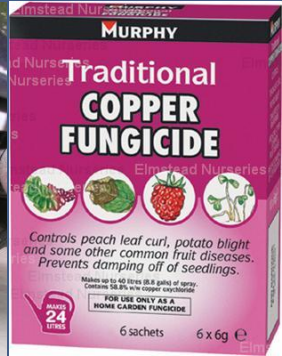
Pesticides: agriculture, golf courses, lawns





# Non-point source pollution can have many impacts:

- Nutrients can cause eutrophication, leading to HABs, hypoxia, loss of habitat and fish kills.
- Copper and arsenic have acute and chronic toxicities
- PAHs can be carcinogenic, mutagenic and/or teratogenic
- Pesticides can be endocrine disruptors, and have carcinogenic and teratogenic effects



# Methodology

## Measure water directly

### Pros:

- Easy to detect change.
- Can measure in the watershed and in marine systems.
- Easy to sample.

### Cons:

- High temporal variability.
- Easy to miss important events.





# Methodology

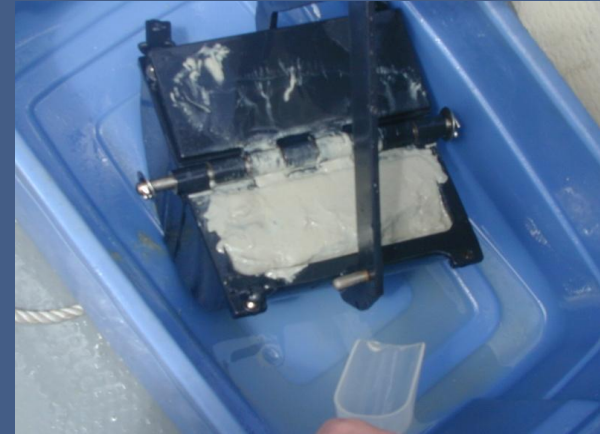
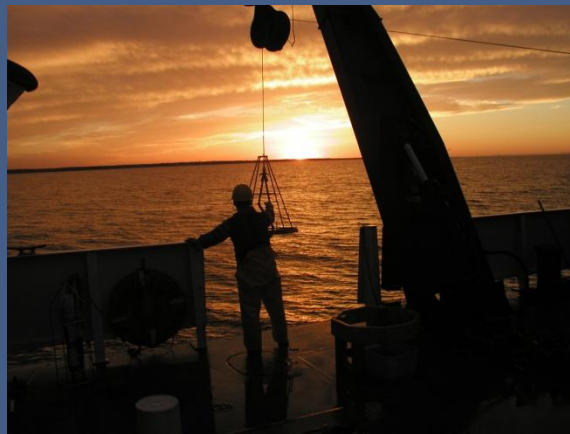
## Measure pollutants in sediments

### Pros:

- Integrates water quality at one site over time.

### Cons:

- Not all pollutants accumulate in sediments.
- Harder to sample and analyze than water.
- Differences in sediment types can complicate comparisons



# Methodology

## Measure pollutants in organisms

### Pros:

- Integrates water quality over time.
- Demonstrates movement into food web.

### Cons:

- Some organisms move.
- Organisms can metabolize contaminants.
- Harder to sample and analyze than water.

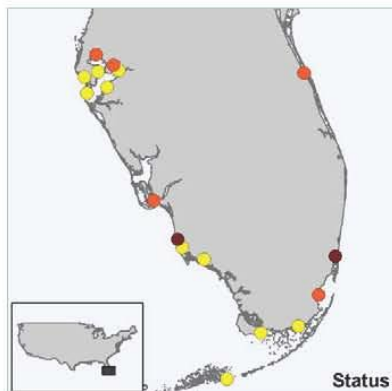


Zebra Mussels



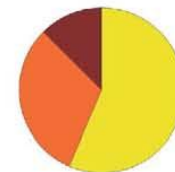
**Motile vs Sessile**

# Example: Mussel Watch Copper in Florida



## BACKGROUND

In a special study of oyster tissue from five sites in southeast Florida (St. Lucie River), elevated levels of copper were attributed to copper used in agriculture (Hameedi, et al. 2006). Copper is an active ingredient in some antifouling paints, fungicides and algaecides, which are heavily used in the region (USGS, 2008; Srinivasan and Swain, 2006; Gianessi, et al., 2002; Leslie, 1992).

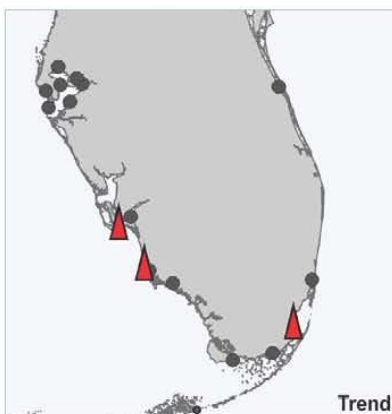


Concentration Percentage

## STATUS

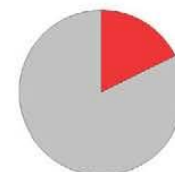
- The proportion of middle and high sites found in South Florida is similar to those found nationally.
- Two of the sites in South Florida are among the highest in the nation.

No Trend ●



## TRENDS

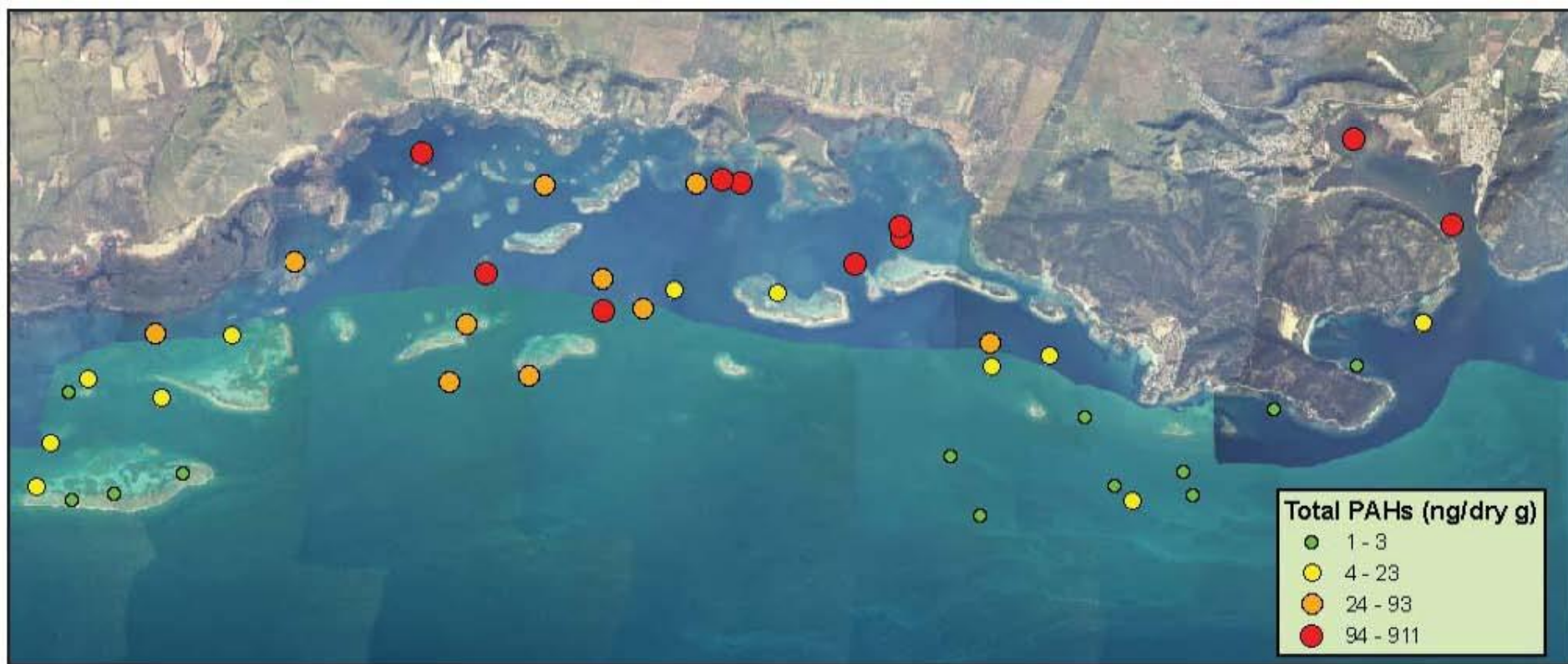
- As a region, South Florida copper does not have a significant trend.
- Three sites, located near urban population centers on the Gulf and Atlantic Coasts (Fort Myers, Naples Bay, and Gould's Canal in southern Biscayne Bay), have increasing copper trends.
- No site in South Florida has a decreasing trend.



Trend Percentage



# Example: Puerto Rico Sediment PAHs



# Resources useful for environmental educators

- National Status and Trends data set

[http://www8.nos.noaa.gov/cit/nsandt/download/mw\\_monitoring.aspx](http://www8.nos.noaa.gov/cit/nsandt/download/mw_monitoring.aspx)

Or google “national status and trends portal”

- NCCOS publications

<http://www8.nos.noaa.gov/nccos/publications.aspx>

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Questions?

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